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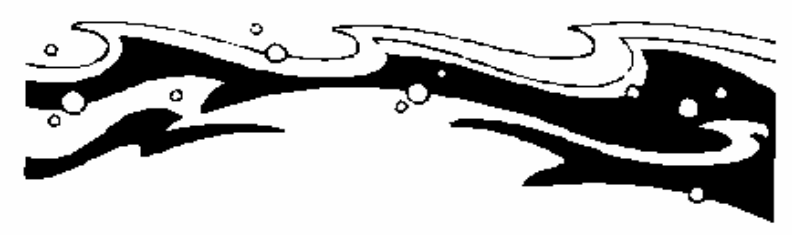
MARINA FUELING FACILITY PROJECT REPORT



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Thanks to all Certified Unified Program Agencies and Regional Water Quality Control Boards who participated by forwarding the data from their inspections of marina fueling facilities statewide.

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Appendices will be provided upon request.

EXECUTIVE SUMMARY

The Marina Fueling Facility (MFF) Project was a statewide study to evaluate the status of MFFs. In response to environmental health problems associated with oxygenates, on October 7, 1997, former Governor Pete Wilson requested the State Water Resources Control Board (State Water Board) to convene an advisory panel to evaluate MFFs to determine whether fueling system upgrades should be made.

The State Water Board then convened an advisory panel of industry, fueling system design engineers, marina owners/operators, water agencies, and staff of the Regional Water Quality Control Boards (Regional Water Boards) and Certified Unified Program Agencies (CUPAs) to evaluate the effectiveness of marina fueling systems. As a result of their research efforts, the advisory panel published the Report of the State Water Resources Control Board Advisory Panel on Fueling and Refueling Practices at Marinas (Advisory Panel Report), which found inadequate and inconsistent design, construction, operation, and regulation of marina fueling systems. The Advisory Panel Report recommended specific actions to help promote environmentally sound marina fueling systems[1].

The State Water Board devised a plan to implement the advisory panel's recommendations. The strategy was to study current marina fueling practices and technologies to determine how best to implement the advisory panel's recommendations. Next, onsite inspections were conducted to evaluate whether these marina fueling-systems were designed and operated in a manner that minimizes the likelihood of fuel releases to California's coastal and inland waterbodies. Data for the State Water Board's report was collected and analyzed in 2001 and 2002, and current figures may deviate slightly from what is reported here.

The major finding of the research was that marina fueling systems are not designed, constructed, or operated to prevent fuel releases.

Of the 183 MFFs inspected, 75% of the fuel piping was single-walled, approximately 50% of all fuel piping was over water, underwater, or floating on the water, and approximately 80% of all fuel piping was not monitored for fuel releases.

Overall, much of the fuel piping inspected was designed in such a way that in the event of a leak or catastrophic failure, fuel would directly enter California's coastal and inland waterbodies. Releases from these poorly designed systems can be detected only after hazardous substances have entered the environment.

The State Water Board staff also found existing laws and regulations are inconsistent across regulatory programs and in many cases no requirements exist at all. The result is inconsistent oversight and program implementation by CUPAs, Regional Water Boards, and the State Water Board. These inconsistencies can greatly impede the protection of water quality across the state.

[1] See Appendix I for the recommendations generated by the Advisory Panel Report.

In regards to water quality, MFF fuel releases are classified as nonpoint source (NPS) pollutants, and preventing fuel releases from underground storage tanks (USTs) from reaching the water is essential. The release of fuel, which contains a variety of compounds (including benzene, hydrocarbons and oxygenates), to the waters of the state can impact not only aquatic life and the ecosystem, but public health, as well.

To protect California's coastal and inland waters from fuel releases caused by poorly designed, constructed, and operated MFFs, State Water Board staff recommends taking the following steps:

1. Upgrade marina fueling systems consisting of either USTs or aboveground storage tanks (ASTs) as follows:

    - Upgrade or install fully-double walled systems;
    - Use appropriate continuous electronic leak detection between the primary and secondary containment;
    - Have all piping used in aboveground applications approved by a independent testing organization in accordance with industry standards;
    - Use anti-siphon devices; and
    - Have an Emergency Shut-Off switch.

2. Regulate MFFs, having either ASTs or USTs, under the same requirements.

INTRODUCTION

Visiting any of California's nearly 300 busy marinas during the summer is evidence that our recreational waterways are used to their full advantage. The nearly 900,000 watercraft[2] currently registered by the Department of Motor Vehicles depend on those marinas for 30 million gallons[3] of fuel per year. With California's expanding population, it is anticipated that the number of registered boats and amount of fuel dispensed at marinas will increase over time. It is crucial that our marina fueling systems are designed, constructed, installed, and operated so that they protect our waterways.

In response to environmental health problems associated with fuel oxygenates, on October 7, 1997 former Governor Pete Wilson requested that the State Water Board convene an advisory panel to evaluate MFFs to identify whether fueling-system upgrades should be made. The Advisory Panel Report, published in January 1999, (Appendix I) reported the following:

- There are more than 220 marinas with fuel docks on coastal and inland waterways consisting of aboveground and underground storage tanks with aboveground, underground, over-water, and underwater piping systems.
- Statutory and regulatory language applicable to MFFs is often inconsistent, and in some cases, absent.
- Inadequate technologies and materials are used for MFF design and construction.
- Implementing agencies provide neither adequate MFF oversight nor enforcement.
- MFF design and operation need improvement to reduce the likelihood of fuel releases into California's coastal and inland waterbodies.

In all, the Advisory Panel Report identified 14 major issues needing attention as well as recommendations for correcting the problems. Located in Appendix I is a table of concerns identified by the Advisory Panel Report, the follow-up actions taken relative to each issue, and the status of each action.

Although the Health and Safety (H&S) Code allows the State Water Board to develop specific regulations governing UST marina fueling systems, it is important to first evaluate the design, construction, installation, and operation of existing marina fueling systems. It is also important to follow up on the issues and recommendations identified in the Advisory Panel Report, as those issues and will guide the effort to develop underground storage tank (UST) marina fueling system regulations and standards.

[2] For the purposes of this report, a "watercraft" is a vessel (e.g., cruiser, houseboat, personal watercraft) that is propelled with a motor (e.g., jet, outboard) which uses fuel (e.g., gasoline, diesel).
[3] Because throughput data is for 183 of the 283 known MFFs, it is believed that annual fuel throughput at California's MFFs is much higher.

SCOPE OF WORK

The primary goals of the MFF Project were to:

- evaluate the existing design, construction, and operation of UST and AST marina fueling systems statewide;
- establish a comprehensive design and construction standard that provides adequate environmental protection and complies with all applicable codes;
- implement the recommendations published in the Advisory Panel Report; and
- coordinate effective follow-up actions for those recommendations that are beyond statutory authority or are within the jurisdiction of other regulatory agencies.

To achieve these goals, State Water Board staff conducted onsite inspections to become familiar with existing MFF design and construction. Early in the project, staff identified what information was needed to implement the Advisory Panel Report's recommendations and then developed tasks to obtain this information. Each section of this report reflects a designated task, and includes the need to:

- evaluate the structure of UST and AST regulatory programs as applied to marinas;
- collect and analyze marina fueling system design and construction data;
- evaluate the cause, frequency, and environmental impact of fuel releases at marinas;
- conduct a nationwide survey to determine how other states regulate marina fueling system;
- facilitate development of materials and design standards for marina fueling systems;
- encourage stakeholder participation through outreach and education; and
- facilitate coordination among agencies having jurisdiction over marina fueling systems.

For the purpose of this report, a MFF is a facility that has a fueling system that dispenses product next to or over a waterway. This includes storage tanks located underground, aboveground, and under or over water, that are integral with a floating structure (i.e. pier or dock) as long as the structure is permanently attached to land. In some cases, both the storage tank and the dispenser may be on land, but the vessel fueling operations are over water. The definition does not include bulk plant or terminal loading, or facilities that transfer liquids via a flange-to-flange closed transfer piping system regulated by the State Lands Commission. The definition does not include floating fuel storage tanks (underwater and above-water) that are not integral with a floating structure attached to land. Unless otherwise specified, when the term MFF is used in this report, it means facilities with either ASTs or USTs.

PROJECT IMPLEMENTATION AND EVALUATION

The following section outlines MFF regulatory authority in California, as well as details project implementation and the evaluation of procured data.

UST and AST Program Over-Site

Marina fueling systems (with ASTs or USTs) are overseen by the State Water Board's storage tank programs (where the agency has authority for implementation) and the local fire authority. The systems are also subject to the requirements of the National Fire Protection Association (NFPA). In the interest of public safety, NFPA develops and publishes consensus codes and standards intended to minimize the possibility and effects of fire. Marina fueling systems are subject to the requirements outlined in Flammable and Combustible Liquids Code (NFPA 30), Code for Motor Fuel Dispensing Facilities and Repair Garages (NFPA 30A), and Fire Protection Standards for Marinas and Boatyards (NFPA 303) all of which have language specific to marina fueling operations.

Aboveground Storage Tanks

The State Water Board and the nine Regional Water Boards are charged with regulating marina fueling systems with ASTs. The Aboveground Petroleum Storage Act (APSA) (H&S Code, Chapter 6.67) requires owners/operators of certain aboveground petroleum storage tanks to file a storage statement, pay a fee, and implement measures to prevent spills. These regulated tanks are single tanks greater then 1,320 gallons, or containers with a cumulative storage capacity of greater then 1,320 gallons. Although APSA requires the State Water Board to establish an inspection frequency, this has not been completed due to staffing cuts. Regional Water Boards have found during past inspections that, in general, marina fueling systems are not designed, constructed, or operated in accordance with APSA.

Underground Storage Tanks

Marina fueling systems with USTs are regulated under H&S Code, Chapter 6.7, and Title 23, California Code of Regulations (CCR), which require USTs to be constructed, monitored, and operated to prevent leaks. The State Water Board's UST Program oversees the implementation of the UST program statewide through the CUPAs. CUPAs are required by regulation to conduct annual UST facility compliance inspections.

Because separate agencies are required to implement the programs, the Regional Water Boards are charged with overseeing the AST program and the CUPAs are charged with overseeing the UST program. California's marina fueling systems are not regulated equally or consistently. To add to the problem, California's statutes and regulations are not specific to MFFs, which makes them open to interpretation, difficult to implement, and impossible to comply with.

Because of the lack of specific language in statute and regulation, Senate Bill 2198 (Statutes 1998, Chapter 997) included language that exempts UST aboveground piping at marinas if it can be visually inspected. This exemption remains in effect until such time the State Water Board adopts regulations specific to the design, construction, upgrade, and monitoring of MFFs.

Collection and Analysis of MFF Design and Construction Data

When the State Water Board staff determined they would need to conduct facility inspections to gather site-specific information, the first step was to locate all known MFFs in California. Facility inventories from the Advisory Panel Report, Marina Directory (Department of Boating and Waterways, 1998), Outdoor California (Department of Fish and Game, January 2000), and the AST Program database obtained from the State Water Board's Division of Water Quality (DWQ), were compiled and cross referenced. The information obtained from these sources is limited to facility name, address, marine services, and the water body on which the facility is located. From these lists, 283 MFFs operating along California's coast and inland waterbodies, were identified.

The next step was to arrange for inspections of the 283 MFFs. On October 23, 2000, State Water Board staff sent to all CUPAs and Regional Water Boards a request for help in completing fueling system inspections. The following materials along with the request for assistance (Appendix II.3) were included with the request:

- Participation Questionnaire: This form was sent to Regional Water Board and local agency staff to ask whether they would be interested in participating in the project by conducting inspections and, if yes, whether they would need technical assistance.
- MFF Inspection Form: This is a standard inspection form created to collect MFF design, construction, and operation information.
- Instructions and Glossary: Instructions for correct completion of the MFF Inspection Form and a glossary of terms were provided to ensure consistent data collection.
- MFF Diagram: The State Water Board supplied a generic MFF diagram to help field inspectors locate selected system components, and to facilitate consistent identification of MFF components.

Survey Responses

- 118 Participation Questionnaires distributed.
- 96 CUPAs and 11 Regional Water Boards responded.
- 11 CUPAs did not respond.
- 39 CUPAs and 10 Regional Water Boards reported that they had MFFs in their jurisdictions and would participate.
- 5 CUPAs and 1 Regional Water Board reported that they had MFFs, but could not participate.
- 52 CUPAs reported that they had no MFFs in their jurisdictions.

A table of Participation Questionnaires is in Appendix II.3.

Inspection Form

The State Water Board developed and field-tested a comprehensive inspection form and required its use during the study to ensure consistent gathering of data by the CUPAs and Regional Water Boards. The draft inspection form was previewed by the CUPAs, Regional Water Boards, State Lands Commission, Bureau of Reclamation, United States Environmental Protection Agency (USEPA), California Air Resources Board (CARB), and the Department of Fish and Game (DFG).

The MFF Inspection Form was organized into four sections:

- Facility and Inspector Information: This section records general facility information including: facility name, physical and mailing addresses, and telephone numbers. Information about the agency conducting the inspection was also collected.
- General Site Information: This section recorded information related to the facility's operation including: the identification of the waterbody on which the facility operated; water level fluctuations; and presence of anti-siphon valves, under-dispenser containment, and emergency shutoff valves.
- Tank: This section recorded information on tank type, construction, volume, throughput, product storage and distribution, and leak detection methods.
- Piping: This was the most detailed of the four sections; it recorded data on piping length, adaptability to water level fluctuations, placement, construction material, leak detection methods, and transition points.

If a facility had more than one storage tank, the inspector completed a separate "Tank" section for each one of the tanks. To document the many changes in piping materials associated with each storage tank system, a separate "Piping" section was used for each piping transition. The "Tank" and "Piping" sections were designed to allow the inspector to start the inspection at the storage tank, work through the piping, and finish at the dispenser. If MFF Inspection forms were not complete, they were not included in the data analysis.

Conducting Inspections

Between October 28, 2000 and December 31, 2001, CUPA and Regional Water Board staff conducted 183 MFF inspections. The following is a brief summary of critical inspection data regarding MFF location, design, construction, and operation[4]. For complete information and a breakdown of MFF inspection data please refer to Appendix II.3.

[4] Only select data are presented here, therefore not all data presented will equal 100%. A comprehensive review of inspection data can be found in Appendix II.

Summary of Inspection Data

- Approximately 75% of the MFFs were located on inland freshwater-ways and 25% were located on coastal waters.
- A throughput of 30 million gallons of fuel at 159 of the 183 MFFs inspected (87%):
    - 38% Gasoline
    - 53% Diesel
    - 1% Premix[5]
- Product distribution from the storage tank to the dispenser (375 storage tanks reported) was:
    - 67% pressurized
    - 19% suction
    - 10% gravity
- Anti-siphon device data was reported as follows:
    - 46% of facilities have the device and it is located at the highest point
    - 33% do not have anti-siphon devices
    - 14% did not report this data
    - 7% have an anti-siphon device but it is not located at the highest point of piping system
- Emergency shut-off switches were present at 86% of the facilities.
- Reported storage tank locations were:
    - 51% land-based ASTs
    - 35% land-based USTs
    - 7% were on the dock above-water
    - 5% were at the dock underwater
- A total of 375 storage tanks were located at the 183 facilities:
    - 58% were double-walled
    - 22% were single-walled
    - 15% were single-walled with non-integral secondary containment
- Methods of double-walled leak detection were reported for 216 of the 373 storage tanks inspected:
    - 58% continuous/electronic monitoring
    - 30% visual monitoring
    - 4% manual sticking
    - 1% no monitoring[6]

[5] A premix fuel is an oil and gasoline mixture used for 2-cycle engines.
[6] All double-walled USTs that reported leak detection data use continuous electronic monitoring as required by regulation; manual sticking, visual, and no monitoring are methods used with ASTs only.

- Methods of single-walled leak detection for 82 of the 375 storage tanks inspected:
    - 50% visual monitoring
    - 32% automatic tank gauging
    - 12% none
    - 4% manual sticking[7]
- There were 1,727 piping sections: 75% single-walled and 25% double-walled.
- Piping sections were located:
    - 34% under the dock
    - 29% aboveground
    - 16% underground
    - 14% above/along side the dock
    - 2% underwater
    - 1% floating on the water
- Single-walled piping material consisted of:
    - 65% metallic
    - 28% rubber-hose
    - 6% non-metallic rigid and flexible product pipe
- Double-walled piping consisted of primary and secondary piping materials.

  Primary piping material was:
    - 39% metallic
    - 29% non-metallic flexible
    - 17% non-metallic rigid
    - 15% rubber-hose

  Secondary piping material was:
    - 47% non-metallic rigid
    - 31% non-metallic flexible
    - 15% rubber-hose
    - 4% metallic
- Single-walled piping leak detection was:
    - 62% visual monitoring
    - 18% no monitoring
    - 12% electronic monitoring
    - 3% line tightness testing
    - 2 % mechanical monitoring

[7] All single-walled USTs that reported leak detection data use electronic monitoring (automatic tank gauging) as required by regulation; manual sticking, visual, and "no monitoring" are methods used with ASTs only.

- Double-walled piping leak detection was:
    - 58% electronic monitoring
    - 26% visual monitoring
    - 11% no monitoring
    - 4% mechanical monitoring
    - 1% line tightness testing
- Single-walled piping transition points were located:
    - 64% over water
    - 29% overland
    - 1% underwater
    - 1% underground
- Double-walled piping transition points were located:
    - 52% over water
    - 41% overland
    - 2% underground
    - 1% underwater
- Under-dispenser containment was present at 21% of 183 facilities reporting this data.

In summary, there exists a large population of storage tanks on the shores of California's coastal and inland waterbodies. They pump millions of gallons of fuel every year and have components that are located on land, over the water and under the water. Many of them are not designed, constructed or operated to insure prevention of fuel releases because they are not secondarily contained; not monitored with continuous leak detection equipment; not using piping intended for use in an aboveground application. Instead, marina owners and operators rely on visually monitoring the system components and looking for a sheen on the water, instead of preventing the releases in the first place. Without secondary containment and continuous electronic leak detection that alerts a marina owner/operator about a leak from the primary containment into the secondary, releases from the tank system end up directly in the environment.

Reported Fuel Releases at MFFs

Because of the limited research of fuel releases in the Advisory Panel Report, State Water Board staff implemented a plan to further study fuel releases reported at MFFs. The goal of this research was to identify the origin of the releases in the fueling system and/or fueling operations. By evaluating the number and type of fuel releases, it was possible to identify potential sources (i.e., piping, storage tank, dispensing nozzles), causes (i.e. corrosion, fueling operations), and confirm the fact that there are ongoing fuel releases to California's coastal and inland waterbodies.

State Water Board staff researched the requirements of reporting fuel releases. They are:

- Any spill of petroleum, either to land or water, is a “discharge” and is a violation of the Water Code unless the discharger has a National Pollutant Discharge Elimination System (NPDES) permit. These discharges must be reported to the Regional Water Board, and if the quantity is over 41 gallons, the discharge must also be reported to the Governor’s Office of Emergency Services (OES).
- Any release from an AST is both a discharge under the Water Code and a "release" under the H&S Code. Responsible parties must report motor vehicle fuel releases to the OES and the Regional Water Board if the quantity is over 41 gallons.
- Any release from an UST is a discharge under the Water Code and a "release" under the H&S Code. Responsible parties must report these releases to the State Water Board, regardless of quantity.

The next step was to search through sources of fuel release data. The two known databases of reported fuel releases are the OES Spill Reporting Center and the State Water Board’s Leaking Underground Storage Tank (LUST) database. The OES data includes releases reported from January 1997 through December 1999 (data from 2000 and later were not available at the time this data was tabulated). The LUST data includes releases reported from January 1982 through September 2002. Although the LUST data dates back to 1982, 85% of the data collected is from 1990 - 2002.

Both the OES and LUST databases include data from all facility types. Therefore a search of fuel releases was conducted using key words such as: marina, harbor, dock, pier, lake, river, yacht, boat, and berth. Using key words, data was extracted from the OES and LUST databases and further reviewed to verify that only MFFs were selected. State Water Board staff accomplished this by comparing a facility’s address and it’s proximity to the water’s edge. During this process, accounts or descriptions of the cause of releases were carefully evaluated. Fuel release incidents were placed into different categories based upon the cause of the release. The release categories used were: Bulk Transfer/Terminal Operations, Fueling System Failures, Dispensing Operations, Unknown, and Other. Because Bulk Transfer/Terminal Operations are regulated by the State Lands Commission and not identified in the scope of this work, we eliminated the data from any further analysis. A breakdown of MFF Fuel Release Data can be found in Appendix III.

Using the above approach narrowed the data to 239 fuel releases at MFFs statewide. Analysis of these releases provided the following breakdown;

- Fueling system failures accounted for 46% of the releases. Fueling system failures are reported as overall structural failures, corrosion, and piping failures due to cracks or component separation.
- “Unknown” causes accounted for 32% of the releases. Releases reported as “unknown” mainly consisted of reported sheens where the cause or source was

either not reported or was unknown. Whether or not these sheens were near the marina fueling system, they were reported as being near a MFF.

- Dispensing operations accounted for 17% of the releases. The data consistently identified releases from dispensing operations to be associated with boat overfills, vent burp-back[8], the use of hold-open latches, and inattentive fueling operations.
- The remaining 5% of the releases were categorized as "other." These fuel releases (reported as sheens) were mainly from operation, construction, or maintenance of the marina fueling system, and one release was reported where a boat caught fire and sank.

Based on staff field inspection experiences and input from CUPA and Regional Water Board staff, it is a fact that many fuel releases are not reported for two reasons: either the amount of product released is below the minimum reporting limit; or, the responsible party failed to report the release as required. Therefore, it is most likely that the release data presented in this report is not representative of the actual number of fuel releases.

As identified in the Advisory Panel Report, releases could be reduced through improved MFF design and construction. With 46% of the release data coming from fueling system failures, it's possible that the number of fuel releases would be significantly reduced through the use of design and construction standards for marina fueling systems that is environmentally protective and consistent with all applicable codes.

Nationwide Survey of Marina Fueling Laws and Guidelines

To understand how other states are regulating marina fueling systems and to research their regulations, the State Water Board conducted two nationwide email surveys. The purpose was to identify any existing laws or guidelines that could be used to develop of marina-specific regulations for California. Staff asked for rules or guidelines that were in place, or under development that related to construction and operation of marina fueling systems specifically.

Of the 50 states surveyed, 40 states responded. Of those, 36 states were using federal and state UST or AST rules that were not specific to marina operations (California is among this group). Four states, Arkansas, Illinois, Nevada, and Oklahoma, had specific laws governing marina fueling. Two states, Maryland and Wisconsin, were in the process of developing laws. Three states, Maryland, Wisconsin, and Montana, reported that they operate by guidelines rather than laws.

Some key elements of other states' laws:

- The Arkansas Fire Protection Code requires: marina dispensing activities to be under the direct control of a competent person; emergency pump shutoff switches to be readily accessible; and all piping that is attached to piers, wharves, or other

[8] Vent burp-back is caused when trapped fuel fumes in the vent line condense into liquid fuel that will expand when heated and cause a fuel release through the vent lines.

structures to be protected against physical damage and excessive stress. (Arkansas State Fire Prevention Code, Section 907.11)

- The State of Illinois requires: detailed plan checks; leak detection equipment; use of anti-siphon and manual shut-off devices; flexible piping from shore to dock; and under-dispenser containment. (State of Illinois, Title 41: Fire Protection, Chapter 1, Part 170.)
- The State of Nevada requires[9]: the marina storage tanks to meet the requirements of the 2003 edition of the International Fire Code; that tanks with stations and pumps not integral to the dispensing device must be located onshore; that the tanks possess a secondary containment area made of steel or concrete; that new or replaced piping be non-metallic and double-walled with leak sensors; and non-integral dispensers must have sumps with leak-monitoring sensors and emergency shut-off devices. (Nevada Administrative Code Sections 459.9921 to 459.999)
- The State of Oklahoma requires: double-walled piping; under-dispenser containment with sensors capable of positive shutdown; emergency breakaway devices; and emergency shut-off switches. (State of Oklahoma, Title 165, Chapter 25 and Chapter 26.)

Some key elements of State guidelines:

- The State of Maryland's guidelines identify three types of fueling docks: shore mounted dispensers, fixed piers, and floating piers. Recommendations are based on fueling dock type and include requirements for: use of flexible primary product piping installed in PVC; line precision test at time of installation; and routine inspections by a qualified petroleum service company. Plan checks by regulatory agencies are also recommended. Maryland's guidelines discuss the use of underground independent testing organization listed pipe in aboveground applications. The State of Maryland allows listed product pipe aboveground when the primary piping is contained in Schedule 40 PVC for ultraviolet (UV) protection and structural support.
- Wisconsin's guidelines include the following key elements: dripless automatic shut-off nozzles without hold-open latch devices; dispensers with shear valves; flex connectors strategically located to compensate for horizontal and vertical movement; and piping with secondary containment.
- Montana's guidelines parallel the Uniform Fire Code (UFC) requirements. The key elements identified in these guidelines include: piping protection from physical damage, external corrosion and excessive stress; secondary containment for piping in sections where a release could directly enter water; anti-siphon valves; dispensing of fuel by a competent person; rack or reel hoses when not in use; and plan check of installations and modifications.

[9] Data for the State of Nevada was obtained after the summary table for the Nationwide Survey of Marina Fueling Laws and Guidelines (Appendix IV) was compiled, and shortly before this report was published.

In the absence of any state-specific rule, many states have required the use of National Fire Protection Association (NFPA) 30 and NFPA 30A requirements within their jurisdictions. These codes emphasize public safety and fire protection, not environmental protection. Appendix IV contains a table of state responses entitled "Nationwide Survey of Marina Fueling Laws and Guidelines."

Many states do not have specific rules or detailed guidelines for the regulation of marina fueling systems because currently there are no standard design and construction criteria that emphasize environmental protection. These states support California's efforts, have expressed a strong interest in the development of UL marina standards (discussed in the following section), and acknowledge the need for rules and guidance specific to marina fueling systems.

Underwriters Laboratories (UL) Standard Development Process

The 1999 Marina Advisory Panel Report identified the need for a recognized set of criteria for the design and construction of MFFs, and an evaluation of code consistency. In March 2000, the State Water Board entered into a contract with UL to develop a standard on the design and construction of marina fueling systems. The scope of work to develop Marina Fuel Storage, Piping, and Dispensing Systems (UL 2248) and Aboveground Secondarily Contained Piping for Flammable Liquids (UL 2405) specifically addresses the design and construction of marina fueling so that they would be environmentally protective and consistent with all applicable codes.

The scope of Draft UL 2248 and Draft UL 2405 covers material and design criteria for on-shore USTs; on-shore ASTs; storage tanks over water integral with a floating or fixed pier; underground, aboveground, and underwater product piping; secondary containment; leak detection; overfill prevention; spill containment; anti-siphon devices; and under-dispenser containment. In addition, the Standard specifies research and testing of environmental degradation to fuel system components, exposure to ultraviolet radiation, corrosion, fresh and saline environments, and fuel compatibility and permeability. The effort by UL to publish UL 2248 and UL 2405 had depended on a successful contract between UL and the State Water Board.

MFF Project Outreach and Education

An important aspect of MFF Project implementation was to keep marina owners/operators and other interested parties apprised of the project's activities and progress. By providing MFF Project activity updates at various workgroup meetings and conferences, constructive and valuable input towards the project was received. A letter outlining the project activities, progress, and goals was mailed to all known MFF owners/operators on January 22, 2002.

To bring owners/operators, manufacturers, inspectors, and other interested parties together, a technical symposium was held on June 26, 2002. The symposium provided a forum for the exchange of technical information and the discussion of innovative material

and design concepts. Throughout the day, vendors exhibited, demonstrated, and explained marina fuel components and spill response equipment.

MFF Project information is available on-line at: http://www.waterboards.ca.gov/ust/leak_prevention/marina/index.html. The MFF Project web page contains documentation, including MFF inspection forms, the UL workplan, and a statewide MFF facility list. The web page will continue to expand as new information becomes available.

The State Water Board established lines of communication with the regulated community. Their involvement has provided regulators with a better understanding of the design, construction, and operational challenges faced by marina owners/operators because of the lack of availability of marina fueling system components. Appendix V contains the MFF Project Activities Letter and information on the MFF Technical Symposium.

Multi-Agency Coordination

During the course of the MFF Project, State Water Board staff discovered that California state agencies were implementing or evaluating guidelines for the siting, design, and construction of marinas, as well as the fueling systems contained therein. Where there may be overlap in program goals and objectives, multi-agency coordination is important to avoid duplication of efforts and to achieve a cohesive and consistent outcome. Efforts were coordinated with other State Agencies: State Water Board's NPS Program, State Lands Commission, and CARB. The following information is a brief explanation of the efforts to coordinate with each of these agencies.

SWRCB Nonpoint Source

- The State Water Board's NPS Program goal is to improve the State's ability to effectively manage NPS pollution. The State Water Board's Plan for California's Nonpoint Source Pollution Control Program identifies marina fueling systems as a source of pollution. UST staff work with NPS staff on performance and management measures to reduce fuel releases from marinas. Additionally, the plan calls for training of marina owners/operators and regulatory authorities on regulatory requirements and compliance.

State Lands Commission

- The State Lands Commission Marine Facilities Division provides protection for the marine environment at all of the State's 80 marine oil terminals, and is responsible for ensuring the safe and pollution-free transfer of crude oil and product between tanker vessels and land-based facilities. State Water Board staff met with the State Lands Commission to discuss jurisdictional authority of different types of marine facilities to avoid overlap of on-going efforts. As a result, marine oil terminals were not included in the study.

California Air Resources Board

- CARB's goals are to promote and protect public health, welfare, and ecological resources through the effective and efficient reduction of air pollutants. Although marina fueling systems are currently exempt from CARB's vapor recovery requirements, CARB may consider eliminating this exemption. State Water Board staff met with CARB staff to discuss the possibility of implementation timetables so that any future CARB requirements in the UL Standards could be included. At the time this report was prepared, CARB was not moving forward with eliminating the vapor recovery exemption requirements at marinas.

Multi-agency coordination is imperative in reducing duplicative efforts. State Water Board staff should make every effort to coordinate timelines and implement consistent requirements to lessen any impact to MFFs during the implementation of the recommendations identified in this report.

FINDINGS

Marina fueling systems are constructed aboveground, underground, over water, and underwater. The systems can have both single-walled and double-walled components, which may or may not be monitored with leak detection equipment. These systems often use components aboveground that are not intended for aboveground use, resulting in premature component degradation and failure. The State Water Board's findings indicate that marina fueling systems are typically not designed, constructed, or monitored to prevent fuel releases.

Our findings are broken out and discussed under the following topics: Marina fueling System Design and Construction; MFF Regulatory Oversight; Reported Fuel Releases; and Other Important Findings.

A. Marina fueling System Design and Construction

- **Single-Walled Components.** Of the marina fueling systems inspected for the State Water Board's study, 22% of the storage tanks are single-walled and 75% of the product piping is single-walled. The single-walled storage tanks are monitored using electronic leak detection equipment 32% of the time, and single-walled piping uses electronic leak detection equipment 12% of the time. Visual inspection/monitoring, with inconsistent frequency, is the most common method of leak detection for single-walled storage tanks (50%) and piping (62%).

  Although electronic leak detection equipment that alerts the owner/operator to a possible fueling system failure is more reliable than visual monitoring, neither of these methods is capable of detecting a before it enters the environment. If a single-walled component leaks, there is no protection against fuel flowing directly into the water.

  Marina piping that is connected to USTs is not required to have secondary containment with continuous electronic monitoring because of the current marina piping exemption for USTs in H&S Code, Chapter 6.7.

  APSA does not require double-walled containment systems or electronic monitoring for ASTs. Mechanical or electronic line leak detectors have not been evaluated or tested for use on aboveground product piping and could potentially decrease the leak detector's reliability.

- **Double-Walled Components.** Of the marina fueling systems inspected for this study, 58% of the storage tanks and 25% of the piping was double-walled, and electronic leak detection was used for monitoring 58% of the time. Visual inspection/monitoring at various frequencies was the second most common method of leak detection for double-walled tanks (30%) and piping (26%). The advantage of secondary containment is that it prevents leaked fuel from entering the water by containing the fuel until the owner/operator can clean it up and make

the necessary repair to the primary containment. The lack of continuous electronic monitoring between the primary and secondary space may result in the storage of leaked fuel in the secondary containment area longer than the containment was designed for, which could result in containment degradation. Technologies are available to electronically monitor these secondary containment areas and are widely used at conventional UST facilities (i.e., gas stations).

- **Underground Pipe Used Aboveground.** The State Water Board's study found that primary piping constructed of non-metallic rigid and non-metallic flexible materials is used inappropriately in aboveground applications 16% of the time. Piping with an approved independent testing organization listing for underground use is not evaluated for the aboveground conditions encountered at marinas (i.e. ultra-violet exposure, excessive cyclic motion from tidal and wave action, fresh and saline water spray, and water submersion). Using underground listed product pipe aboveground leads to piping degradation and premature piping failure. (Note: There a few types of flexible marina piping manufactured for aboveground marina use; however, this piping does not have an independent testing organization approval for use in aboveground applications in accordance with an industry standard.)

  For USTs, Title 23, CCR requires primary containment be approved by an independent testing organization in accordance with industry codes, or consensus standards. There is no such requirement for MFF piping connected to ASTs.

- **Rubber-Hose and Flexible Piping.** Approximately 44% of the primary piping used at inspected marinas consists of a non-metallic flexible or rubber material. Marinas typically use this flexible piping so that the fueling system can accommodate the docks' up and down, and side-to-side movements. Additionally, as water levels vary, floating docks often move in and out with the shoreline and must be able to 'roll out' more piping. Marina-specific fuel piping is not widely available. When it is available, it does not meet the requirements of all statutes, regulations, and codes. It is State Water Board's understanding that flexible piping used in aboveground applications on or along side the length of the dock is not compliant with National Fire Protection Association (NFPA) requirements. Additionally, the State Water Board found that rubber-hose is highly permeable, which could result in fuel emissions to the environment. When this highly permeable piping is secondarily contained, it can cause a fire hazard by accumulating flammable vapors, or the vapors can condense into liquid and result in a release.

- **Anti-Siphon Devices.** The State Water Board's study shows that marina fueling systems are operated without anti-siphon devices 33% of the time. Without an anti-siphon device, in the event of a catastrophic aboveground piping failure, the contents of the storage tank would be discharged to the water. Although a catastrophic fueling system failure could devastate the local ecology at a marina, an anti-siphon device is required only by the NFPA. Environment protection codes (Title 23, CCR) does not specifically require anti-siphon devices.

- **Emergency Shut-Off.** Marina fueling systems surveyed in the State Water Board's study are operated without emergency shut-off switches 14% of the time. Without an emergency shut-off there is no mechanism for shutting-off the fueling system to avert a catastrophic release. Emergency shut-off switches are required by NFPA; however, 86% of MFFs do not have Emergency shut-off switches, indicating that fire codes are not being widely enforced.

- **Hold-Open Latches.** Marina fueling systems surveyed in the State Water Board's study are operated with fueling nozzles that have hold-open latches 61% of the time. A hold-open latch is a device on an automatic nozzle that holds the nozzle open and permits the fuel to flow even if the operator does not keep continuous pressure on the nozzle. These nozzles are designed to work with motor vehicles, not watercraft. Latch-open devices are prohibited for use on marina fueling systems by NFPA; however only 39% of MFFs have the appropriate nozzle, indicating that fire codes are not being enforced.

- **Floating Tanks.** Use of floating fuel storage tanks (underwater and above-water) that are not integral with a floating structure attached to land are becoming more popular on California's waterways, and are used 12% of the time in the marina fueling system inspected for this study. It is State Water Board staff's understanding that storage tanks used for this type of fueling system are modified (e.g., attached to a platform), which may result in voiding any environmental or safety mechanisms. To our knowledge there is no comprehensive environmental and safety standard for the design and construction of floating fuel systems and they are not covered in Underwriters Laboratories (UL) Marina Fuel Storage, Piping, and Dispensing Systems (UL 2248) standard.

B. MFF Regulatory Oversight

- MFFs with USTs are regulated under H&S Code, Chapter 6.7 and Title 23, CCR. These UST laws are implemented by the CUPAs. MFFs with ASTs are regulated under the H&S Code, Chapter 6.67. Regional Water Boards are charged with oversight of ASTs but are unable to perform inspections at this time. Based on the Regional Water Boards' experience implementing the AST Program and the CUPAs experience implementing the UST Program, it is apparent that marina fueling systems are not regulated equally or consistently. To further compound the problem, the H&S Code, Chapters 6.67 and 6.7, and CCR, Title 23 do not have language specific to MFF operations, resulting in inadequate marina fueling system design, construction, and operation.

- Inspection data identifies several non-compliant marina fueling systems. UST systems appear to be non-compliant as a result of inadequate and inappropriate use of underground piping in aboveground applications and lack of leak detection. ASTs appear to be non-compliant as a result of both inadequate and inappropriate use of materials, as well as inadequate and inconsistent program implementation.

C. Reported Fuel Releases

- Of the marina fueling systems inspected, fuel releases are a result of fueling system failures 46% of the time. Other fuel releases that occur at marinas are from the overfill of watercraft fuel tanks, vent burp-back, bilge water pump out[10], dripping fuel nozzles, and the use of portable fueling cans.

D. Other Important Findings

- Few states have requirements specific to marina fueling systems, and those existing requirements are not comprehensive. Many states acknowledge the need for rules and guidance specific to marina fueling systems and indicate they intend to follow California's lead.

- The effort by UL to publish standards (UL 2248: Marina Fuel Storage, Piping, and Dispensing System, and UL 2405: Aboveground Secondarily Contained Piping for Flammable Liquids) depends on a successful contract between UL and the State Water Board. Timing of the publication of the standards depends on when a contract can be executed.

[10] A bilge pump removes water from the bilge (hull) of a boat. Bilge water can be contaminated with fuel and oil that is then released into the environment when the bilge is pumped.

RECOMMENDATIONS

The following recommendations are presented to improve the design, construction, and operation of MFFs and the effectiveness of regulatory oversight. State Water Board staff emphasize that these recommendations apply to all MFFs and that implementation should be consistent across both the AST and UST programs to avoid creating an exemption for any type of marina fueling system.

A. Marina fueling System Design and Construction

- **Improve marina fueling system design, construction, and operation.** As discussed in the findings, the results of the research indicate that marina fueling systems are not typically constructed or monitored in such a way that fuel releases are contained and detected; nor are they designed to prevent fuel releases from occurring during fueling operations. Therefore, State Water Board staff recommends:

  (1) To contain fuel releases and keep these fuel releases from entering our coastal and inland waterbodies, all marina fueling systems be upgraded to double-walled systems.
  (2) To alert the owner/operator of a release, use appropriate continuous electronic leak detection between the primary and secondary containment.
  (3) To minimize fueling system failures, marina piping used in aboveground applications be approved for such use by an independent testing organization in accordance with industry codes, voluntary consensus standards, or engineering standards.
  (4) In the event of a catastrophic failure, to prevent the contents of the storage tank from draining into the water, use anti-siphon devices.
  (5) To reduce the threat of the marina fueling system operating in dangerous conditions, install an emergency shut-off switch.

- **Execute new contracts with UL to resume work and publish UL 2248 and UL 2405.** Resolve contract issues, locate and secure funds to resume work on publication of the standards.

- **Require by regulation that MFFs be subject to the criteria outlined in the Marina Fuel Storage, Piping, and Dispensing Systems (UL 2248) standard.** As previously discussed, State Water Board staff identified the need for a recognized set of criteria for the design and construction of marina fueling systems. UL 2248 specifically identifies double-walled fueling-system containment, continuous electronic leak detection, and other environmentally protective and safety criteria (e.g., emergency shut-off switches, anti-siphon devices, and nozzles without hold-open latches). UL 2248 is comprehensive in that it covers USTs and ASTs, the siting and design issues faced by marinas, and is consistent with H&S Code and Fire Code requirements. State Water Board

strongly recommends that all MFFs be upgraded to meet the criteria outlined in UL 2248.

Currently, there is no approved independent testing organization consensus standard for product piping in aboveground applications at marinas. Unless required by regulation, there is no incentive for piping manufacturers to design and market piping that is tested by an independent test organization in accordance with industry codes, voluntary consensus standards, or engineering standards. By requiring that all MFFs be subject to the design and construction criteria of UL 2248, the piping systems would be subject to approved independent testing organization in accordance with industry consensus standards. This would create an incentive for manufacturers to develop piping appropriate for aboveground use.

Finally, by requiring MFFs be designed and constructed as outlined in UL 2248, use of emergency shut-off switches and anti-siphon devices would be consistent. These safety and environmental protection devices are needed for use in emergencies and catastrophic fueling system failures. Based on fueling system design, UL 2248 identifies the number and location of emergency shut-off switches and anti-siphon devices needed in marina fueling systems.

- **Contract with UL to develop and publish a design and construction standard for floating fuel storage tanks.** Current law does not address these types of fueling-systems; therefore, they operate with little oversight, resulting in less protection for public safety and the environment. Therefore, State Water Board staff recommends contracting with UL to develop and publish a standard for the use of floating fuel storage tanks (underwater and above-water). Until such standard is developed, no new floating fuel storage tanks should be allowed on our coastal and inland waterbodies. At such time a standard is published, require by regulation, that all floating fuel storage tanks be designed and constructed as outlined by the standard.

- **Fuel nozzle and watercraft manufacturers should develop products that prevent spills.** This includes developing products that prevent the overfilling of watercraft fuel tanks; vent burp back; bilge water contamination; and nozzles that drip. The State Water Board's NPS program identifies these as nonpoint source pollutants, and should consider requiring manufacturers to design better equipment.

B. MFF Regulatory Oversight

- **Regulate MFFs with ASTs or USTs under the same requirements discussed in Section A.** Currently, H&S Code, Chapter 6.7 specifies that UST marina piping is exempt until such time that the Board adopts regulations specific to marinas. State Water Board staff intends to prepare marina-specific regulations for USTs. Because the State Water Board does not have statutory authority to include AST marina fueling systems in this rule-making, a change in legislation is needed

requiring that AST marina fueling systems comply with regulations that are as equally protective as specific regulatory language proposed and adopted for USTs. ASTs should still be required to meet existing federal Spill Prevention Control and Countermeasure requirements.

- **Implement specific marina fueling regulations (USTs) and legislation (ASTs) by a single program agency.** Not only are marina fueling systems regulated under two different chapters of the H&S Code (based on whether the storage tank is aboveground or underground), they are regulated by two different agencies. The Regional Water Boards are charged with overseeing ASTs and the CUPAs are charged with overseeing USTs. State Water Board staff proposes that the CUPAs implement marina fueling system requirements for both USTs and ASTs.

- **Due to the complexity of marina fueling systems and the detailed oversight needed, develop marina fueling program guidance.** Develop inspection training for CUPA inspectors and compliance training for owners/operators. Also, inspection and compliance materials should be developed and published to assist with overall implementation of program requirements.

Marina fueling Facility Project Report Appendices

APPENDIX I	Report of the State Water Resources Control Board's Advisory Panel on Fueling and Refueling Practices at California Marinas and Other Follow Up Materials
APPENDIX II	Marina Fueling Facility Data Collection and Analysis
APPENDIX III	Marina Fueling Facility Fuel Release Data
APPENDIX IV	Nationwide Survey of Marina Fueling Laws and Guidelines
APPENDIX V	Marina Fueling Facility Project Outreach and Education

Appendices will be provided upon request.